DOOSAN

Optimal Solutions for the Future

NHM series

Heavy-Duty Horizontal Machining Center

The New Generation World-Class NHM series of Heavy-Duty Horizontal Machining Centers

The NHM series combines the heavy-duty cutting, unsurpassed machining capacity and productivity to meet your various production requirements. The optimally integrated structure of box guideways assures higher rigidity required for heavy-duty cutting of titanium.
A variety of NHM series - NHM5000, NHM6300 and NHM8000 are available to produce workpieces of various shapes and sizes. Additionally servo-driven tool changing and pallet changing are designed to improve reliability and productivity by reducing idle time.

NHM series

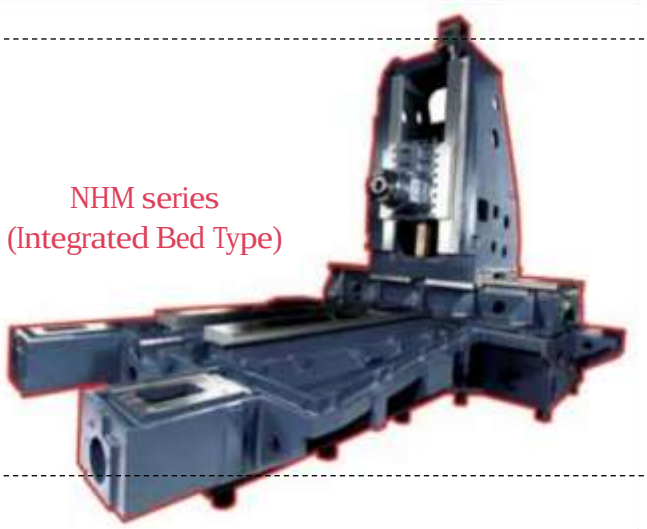
NHM 5000/6300/8000

New Features

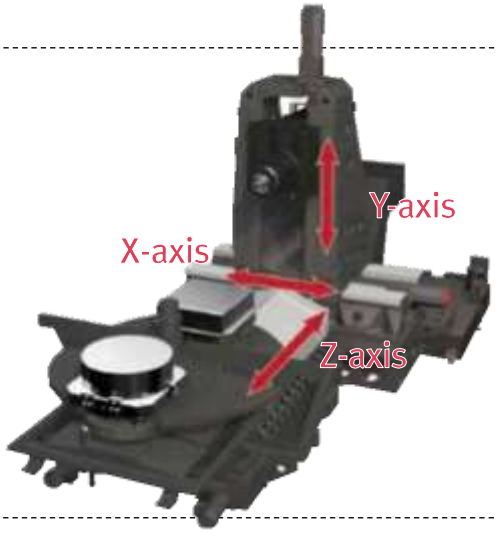
The NHM series offers the largest machining capacity and higher productivity by applying the latest design technologies.

Integrated structure

The optimally integrated structure has been applie to the design of machine frame with box guideway for all axes in order to raise the rigidity for heavy-duty cutting.

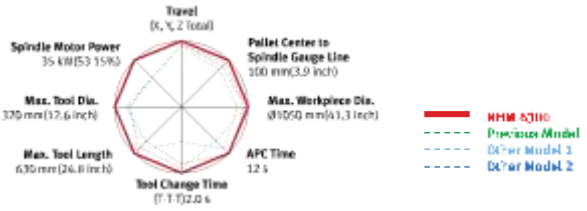


NHM series
(Integrated Bed Type)



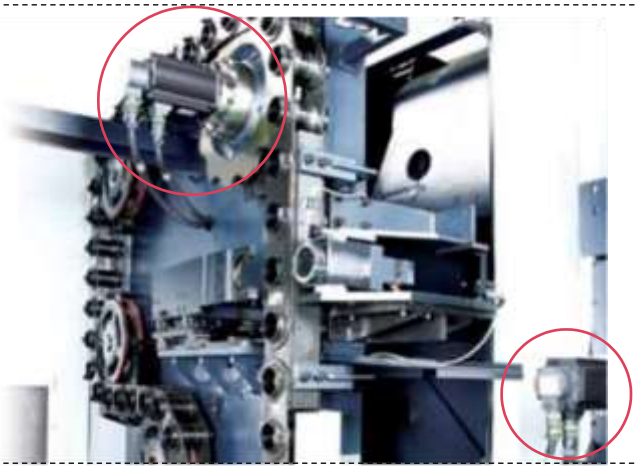
The largest machining capacity

meeting the best at global standard in every aspect with the integrated structure



3 Servo-driven tool changing and pallet changing

offer more reliability by simplifying parts and easy maintenance, and higher productivity by high-speed pallet changing.



Integrated Structure

The optimum integration and design of bed and column structure extend the travel range even under similar machine size to the previous models and improve rapid traverse by 125% from the previous models.

Highly rigid bed, made from top-grade cast iron, maintains high stability and everlasting durability of the machine

The NHM series bed is designed with using FEM analysis technology for the purpose of the high rigidity to support the moving units. NHM series structure based on bed with new M and W-shaped ribs ensures consistent heavy-duty cutting.

W-shaped

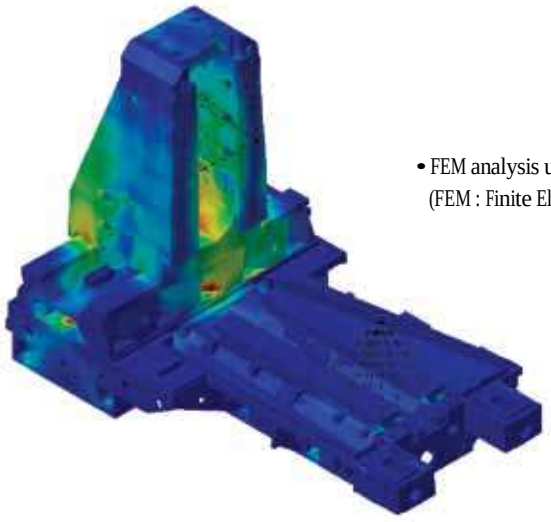
M-shaped

Static rigidity

The high-rigid structure of NHM series has raised the static rigidity up more than previous models through FEM analysis.

Dynamic stiffness

Dynamic analysis was used in simulations of actual cutting to improve dynamic stiffness and dampen vibration during design stage.



• FEM analysis used to design a stable body.
(FEM : Finite Element Method)

Travel (X/Y/Z)

Previous model
800/650/650 mm
(31.5/25.5/25.5 inch)

▶ NHM 5000
800/700/850 mm
(31.5/27.5/33.4 inch)

Previous model
1000/800/850 mm
(39.3/31.5/33.4 inch)

▶ NHM 6300
1050/850/1000 mm
(41.3/33.4/39.3 inch)

Previous model
1250/1000/1000 mm
(49.2/39.3/39.3 inch)

▶ NHM 8000
1400/1050/1200 mm
(55.1/41.3/47.2 inch)

Rapid traverse (X/Y/Z)

Previous model
24/24/24 m/min
(944.9/944.9/944.9 ipm)

▶ NHM 5000/6300
30/30/30 m/min 25% ▲
(1181.1/1181.1/1181.1 ipm)

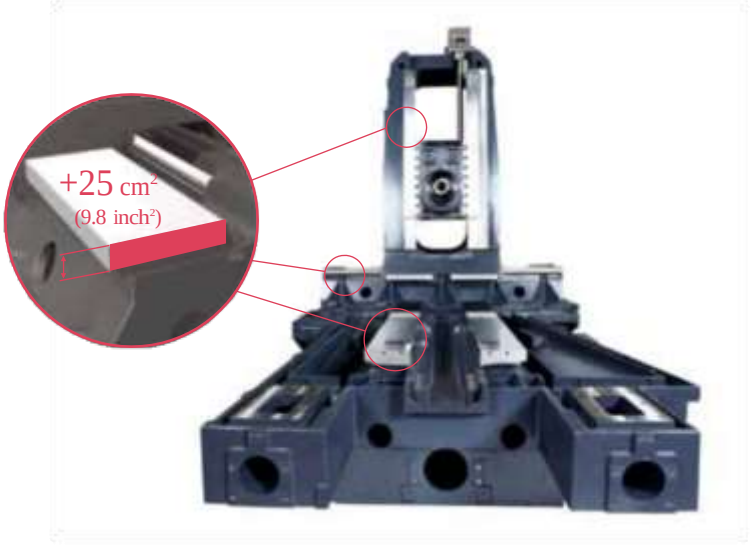
Extended box guideway

Extended cross-section of box guideway for all axes provides higher rigidity. With optimized dynamic rigidity of main sliding parts, the heavy-duty cutting has also been improved.

• Section area the guideway

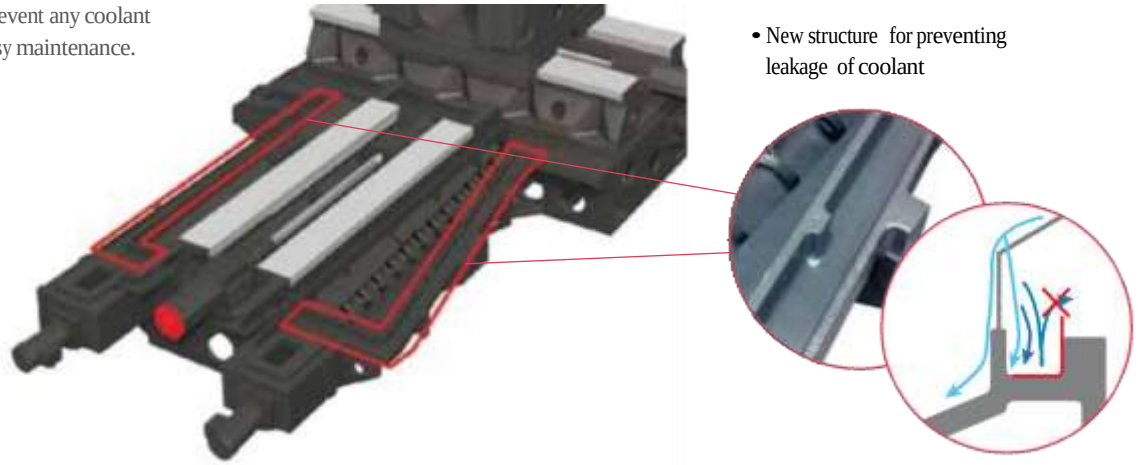
Previous model
90 cm^2
(35.4 $inch^2$)

▶ NHM 5000/6300/8000
115 cm^2 / 28% ▲
(45.2 $inch^2$)



New structure with dual wall

Designed to prevent any coolant leakage for easy maintenance.



• New structure for preventing leakage of coolant

Enhanced High Power Spindle

NHM series' gear-driven spindle with high torque and power demonstrates superb performance in powerful cutting across a wide range of materials.

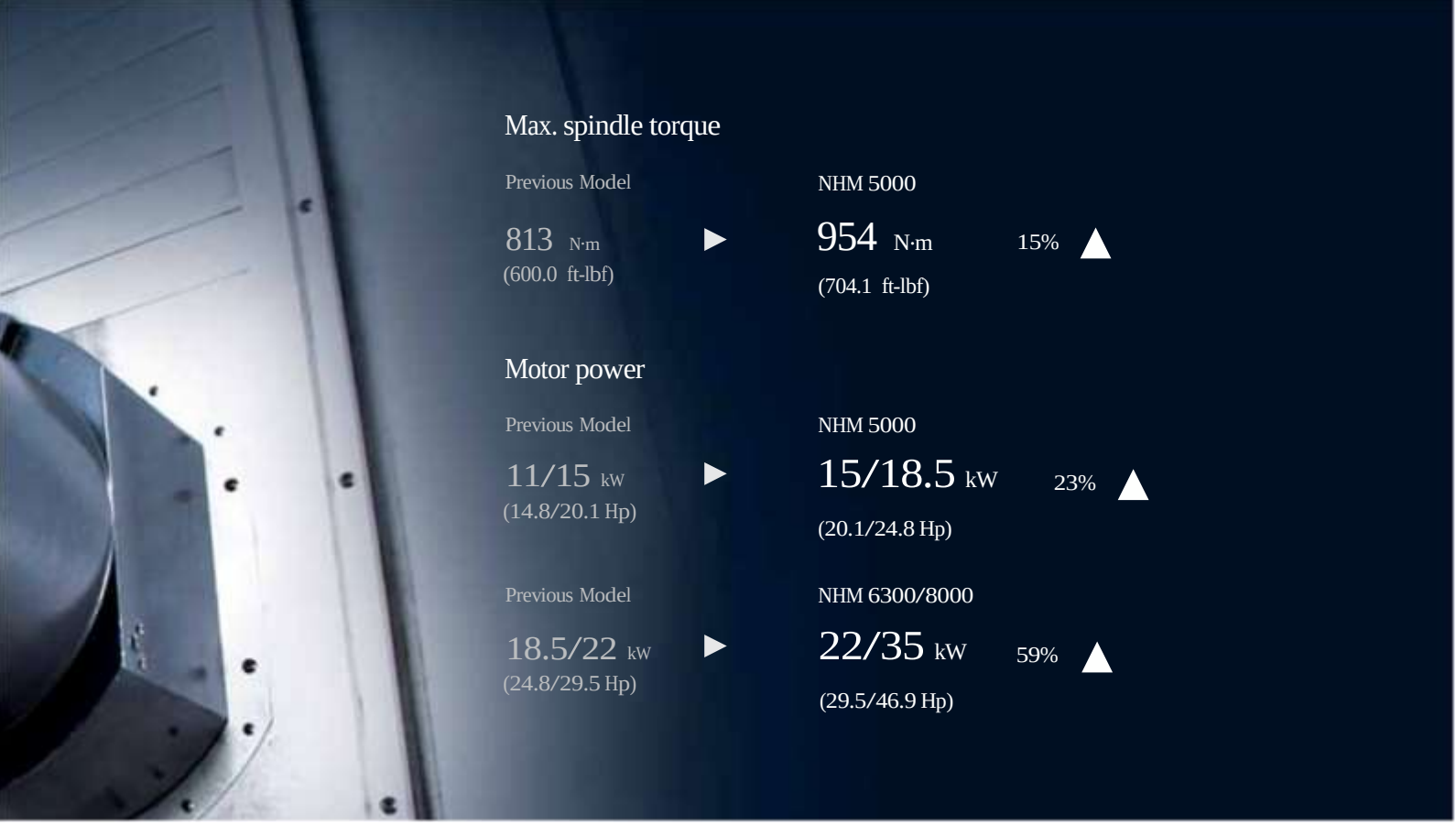
Improved spindle

The reliability of NHM series spindle is based on an improved gear train and bearings of upgraded design. These heavy-duty, 50 tapered spindles are supported by a row of permanently lubricated angular-contact bearings, precision class P4.

The spindle's rigidity is improved by adapting larger bearings. The two-speed gear-driven spindle provides a broad spectrum of spindle speed for heavy-duty cutting with high torque and power.

Spindle variation

	Max. spindle speed	Motor power	Max. spindle torque
NHM 5000	6000 r/min	15/18.5 kW (20.1/24.8 Hp)	954 N·m (704.1 ft·lbf)
	6000 r/min	22/35 kW (29.5/46.9 Hp) opt.	1732 N·m (1278.2 ft·lbf)
	6000 r/min	30/37 kW (40.2/49.6 Hp) opt.	1991 N·m (1469.4 ft·lbf)
	8000 r/min	22/35 kW (29.5/46.9 Hp) opt.	1732 N·m (1278.2 ft·lbf)
NHM 6300 NHM 8000	6000 r/min	22/35 kW (29.5/46.9 Hp)	1732 N·m (1278.2 ft·lbf)
	6000 r/min	30/37 kW (40.2/49.6 Hp) opt.	1991 N·m (1469.4 ft·lbf)
	8000 r/min	22/35 kW (29.5/46.9 Hp) opt.	1444 N·m (1065.7 ft·lbf)



Max. spindle torque

Previous Model
813 N·m
(600.0 ft-lbf)

NHM 5000
954 N·m 15% ▲
(704.1 ft-lbf)

Motor power

Previous Model
11/15 kW
(14.8/20.1 Hp)

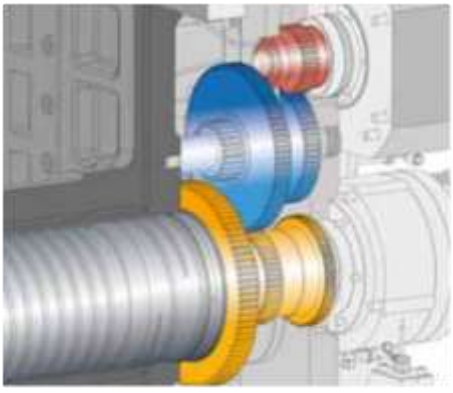
NHM 5000
15/18.5 kW 23% ▲
(20.1/24.8 Hp)

Previous Model
18.5/22 kW
(24.8/29.5 Hp)

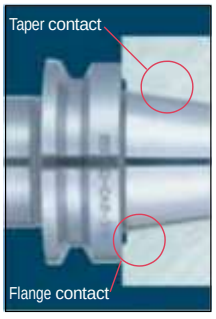
NHM 6300/8000
22/35 kW 59% ▲
(29.5/46.9 Hp)

Highly efficient gear-driven transmission

Applying a gear-driven transmission provides higher torque to perform heavy-duty cutting of difficult-to-cut materials such as titanium



2-Face locking tool system std.



The 2-face locking tool system offers longer tool life, higer power and more precise machining by the dual contact to both of the spindle surface and toolholder flange surface, as well as both the spindle taper and toolholder taper shank. This system is based on the most currently available standards of BT, DIN, CAT and HSK flange tooling.

- Higher rigidity
- Improved ATC repeatability, surface finish and higher precision
- Extending tool life

HSK spindle opt.

The HSK shank system with two restrained faces simultaneously couples the tapered portion of the shank and the flange end face. The hollow 1/10 taper changes flexibly while the flange end face fits tightly to the spindle nose.

Improved thrusting force

Z-Axis thrust

Previous model
11500 N
(2585.2 lbf)

NHM 5000
13800 N 22% ▲
(3102.2 lbf)

Previous model
16000 N
(3596.8 lbf)

NHM 6300/8000
18800 N 20% ▲
(4226.2 lbf)

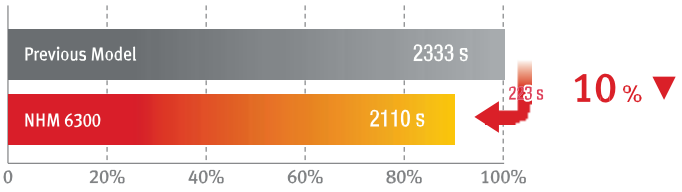
Improved Machining Performance

Productivity

Productivity of NHM 6300 is increased by 10% compared to the previous model.

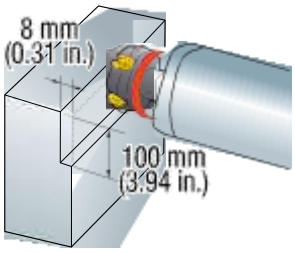
- Automotive part : Carrier middle
- Material : Casting iron
- Number of tools used : 21 tools

Cycle time (s)



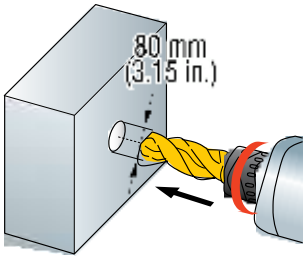
NHM 5000 (Motor power : 15/18.5 kW)

Face mill_carbon steel (SM45C) [ø125mm Face mill (8Z)]



Previous model		NHM 5000
Machining rate 440 cm³/min (17.3 in³/min)	▶	Machining rate 740 cm³/min (45.2 in³/min)
Spindle speed 350 r/min	▶	Spindle speed 500 r/min
Feedrate 550 mm/min (21.7 ipm)	▶	Feedrate 925 mm/min (36.4 ipm)

Drill_carbon steel (SM45C) [ø80mm U-Drill (2Z)]



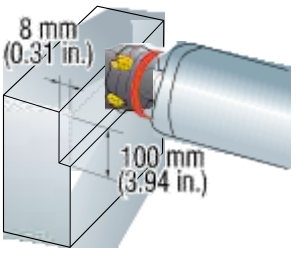
Machining rate
465 cm³/min (28.4 in³/min)

Spindle speed
600 r/min

Feedrate
92.5 mm/min (3.6 ipm)

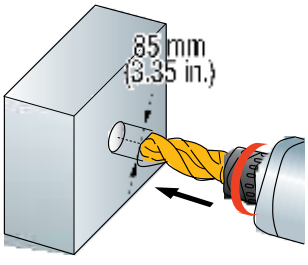
NHM 6300/8000 (Motor power : 22/25 kW)

Face mill_carbon steel (SM45C) [ø125mm Face mill (8Z)]



Previous model		NHM 6300/8000
Machining rate 800 cm³/min (31.5 in³/min)	▶	Machining rate 1405 cm³/min (85.7 in³/min)
Spindle speed 350 r/min	▶	Spindle speed 564 r/min
Feedrate 1000 mm/min (39.4 ipm)	▶	Feedrate 1759 mm/min (69.3 ipm)

Drill_carbon steel (SM45C) [ø85mm U-Drill (2Z)]



Machining rate
767 cm³/min (46.8 in³/min)

Spindle speed
674 r/min

Feedrate
135 mm/min (5.3 ipm)

High Precision Equipment

NHM series machining accuracy can be further improved with high precision equipment.

Air semi-floating device for guideway

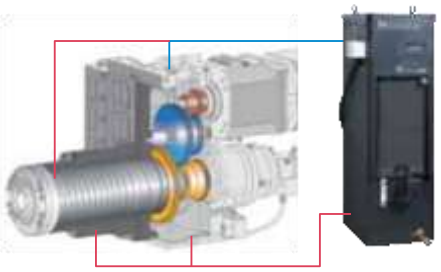
To reduce the friction of X-axis. Moreover, by balancing the center of gravity, the stability of the column can be maintained. It enables the machine to achieve high positioning accuracy and repeatability.

- Air consume

30 L/min (7.9 gal/min)

Spindle head cooling system

The refrigerated cooling system maintains a uniform spindle temperature required for more stable accuracy. Thermo sensors regulate the temperature of the oil circulating through oil jackets around the spindle, as well as the spindle bearings, gears, and motor flanges.

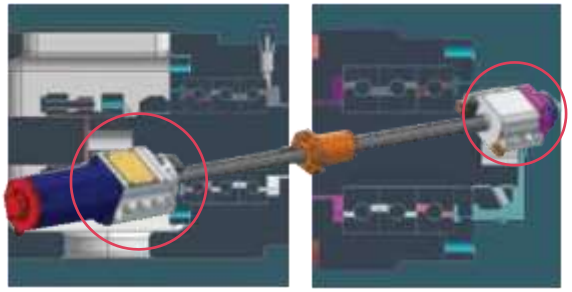


Minimum thermal displacement for high accuracy

Main units of the X, Y and Z axes are designed to minimize the thermal displacement by applying cooling jackets to ball screw nut and ball screw shaft cooling.

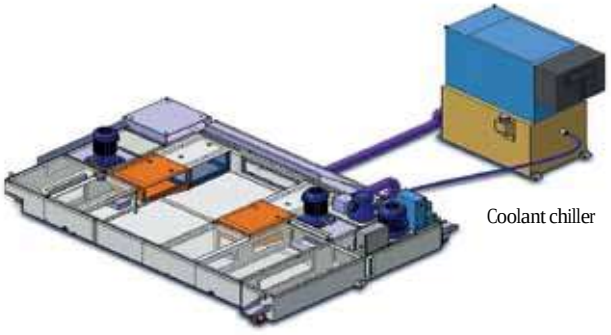
Ball screw shaft cooling opt.

Applying rigid coupling and 3 row bearing supporting for all axes, guaranteeing high accuracy and rigidity for all axes system



Coolant chiller

Machine accuracy is stablized by the coolant chiller that controls heat transfer from coolant to a workpiece, tool, fixture and table.



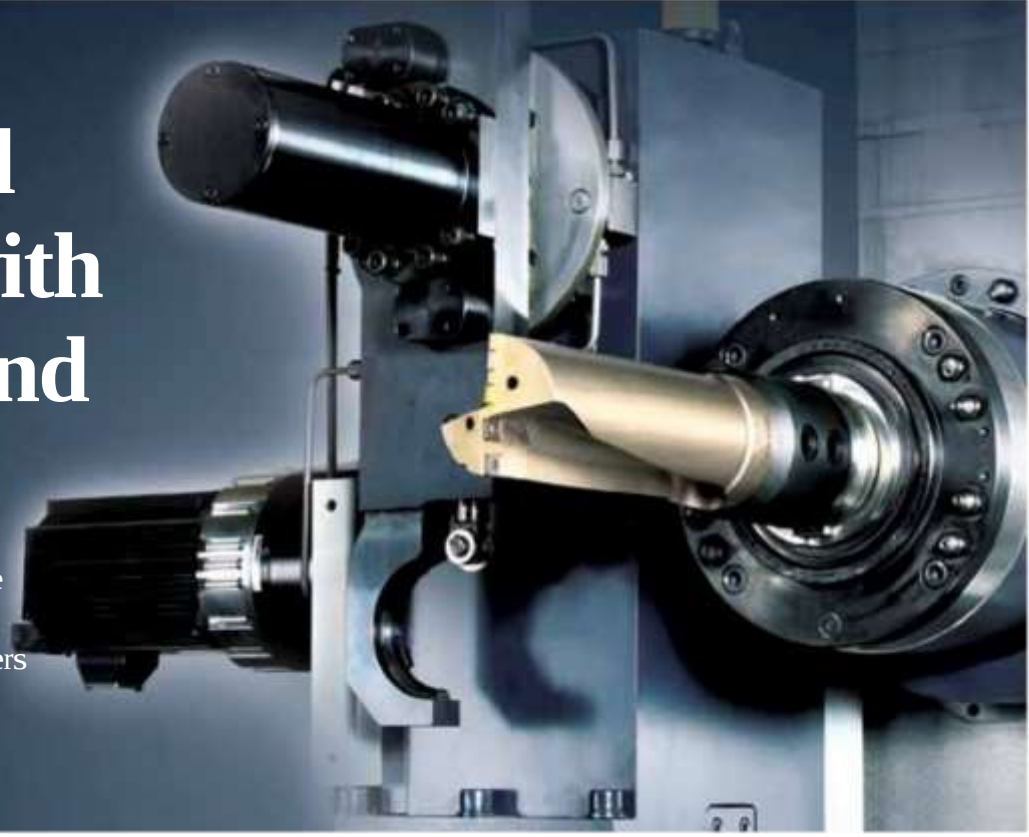
Coolant chiller

Linear scale feedback system opt.

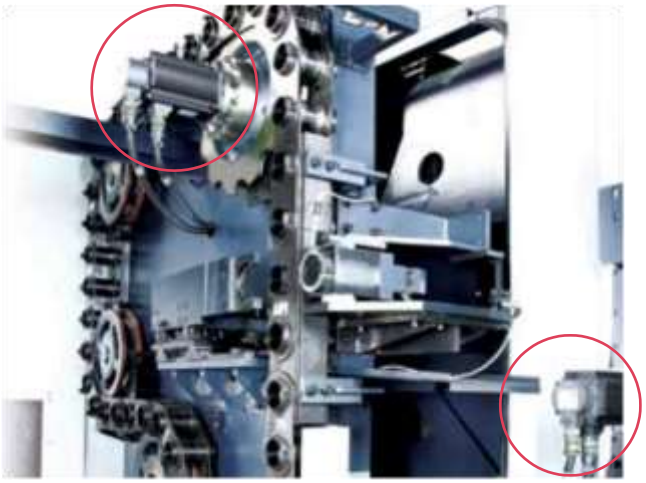
Linear scale feedback system is available to the X, Y, and Z axes to provide high positioning accuracy.

ATC and Tool Magazine with Reliability and Efficiency

Servo-driven ATC & tool magazine improves reliability and reduces tool change time. NHM series offers the bigger tool capacity

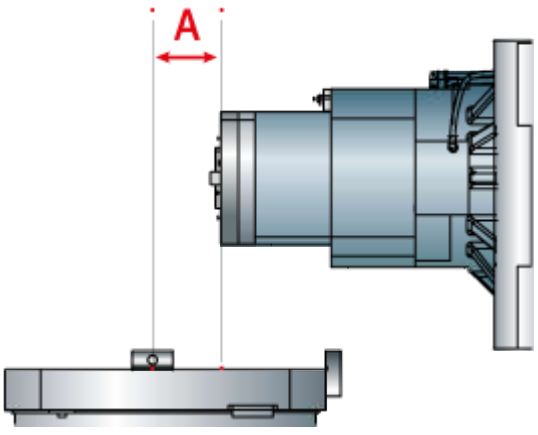


Servo-driven ATC & tool magazine



NHM series servo-driven automatic tool changer allows within 2.0 seconds tool change time, thus ensuring higher productivity. Rapid magazine indexing and spindle positioning allows for high speed tool change and minimizes chip-to-chip time.

Machining with shorter tools



The Z-axis travel from the spindle gauge line to the center of pallet allows for high rigidity machining by using shorter tools.

Previous model		NHM 5000/6300	
150 mm (5.9 inch)	▶	100 mm (3.9 inch)	33 % ▼
Previous model		NHM 8000	
200 mm (7.8 inch)	▶	150 mm (5.9 inch)	25 % ▼

ATC change time (T-T-T)

Previous model		NHM 5000/6300/8000
2.5 s	▶	2.0 s

Max. tool dia. x length

Previous model		NHM 5000	
250 x 400 mm (9.8 x 15.7 inch)	▶	320 x 530 mm (12.6 x 20.8 inch)	320 x 600 mm (HSK) (12.6 x 23.6 inch)

Previous model		NHM 6300/8000	
250 x 550 mm (9.8 x 21.6 inch)	▶	320 x 630 mm (12.6 x 24.8 inch)	320 x 700 mm (HSK) (12.6 x 27.5 inch)

Standard tool capacity increased

The NHM Series has expanded tool storage capacity to 60 tools standard or 376 tools as option.

Chain type magazine

Previous model		NHM 5000/6300/8000
40 ea	▶	60 ea std.
60/90/120 ea	▶	90/120/150 ea opt.

Matrix type magazine

Previous model		NHM 5000/6300/8000
196/256/324 ea	▶	196/256/316/376 ea opt.

Operation panel for ATC & tool magazine

This panel enables the manual operations and data input of tool offset, displays the magazine status (In/out signals and issued alarms).

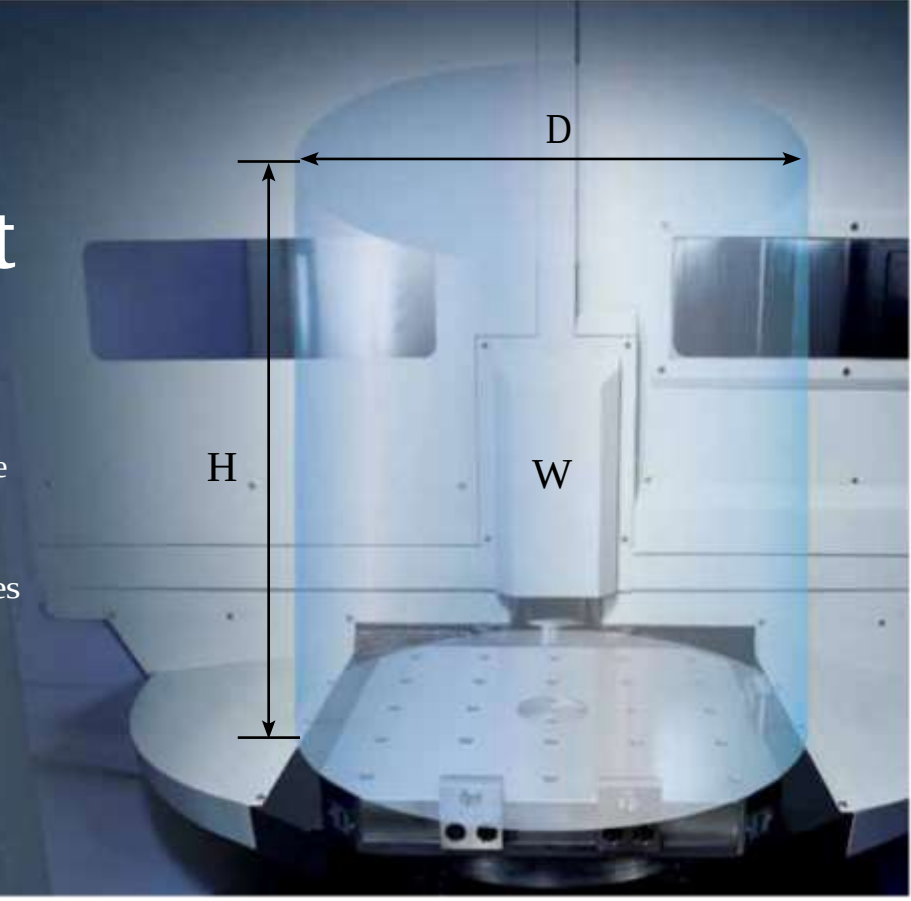
- Home position change

- Step & Recover

- Language selection
- I/O state
- Action step
- Servo parameter
- Special tools
- Counter

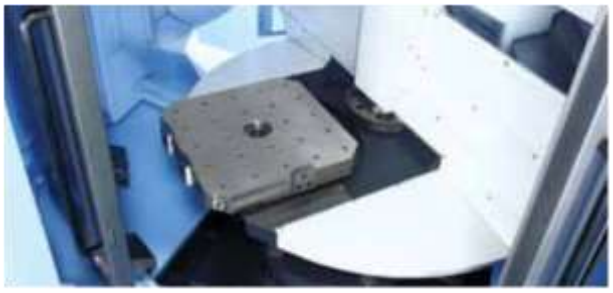
Improved Pallet & APC System

NHM series' integrated structure can handle larger and heavier workpieces, providing maximum work capacity. The servo-driven APC is more stable and accurate. It improves durability by reducing defect rate.



Servo-driven APC

NHM series' servo-driven automatic pallet changer offers high productivity by fast pallet changing. The improved APC's pallet changing time is 200% faster compared to previous models. It offers high reliability and has a wide access space for the operator.



Pallet change time

Previous model 14 s	▶	NHM 5000 8.5 s	▼ 39 %
Previous model 25 s	▶	NHM 6300 12 s	▼ 52 %
Previous model 29 s	▶	NHM 8000 16 s	▼ 45 %

Pallet indexing

Pallet indexing time (0° ▶90°)

Previous model 2.2 s	▶	NHM 5000 1.7 s	▼ 23 %
Previous model 3.7 s	▶	NHM 6300 2.4 s	▼ 35 %
Previous model 3.9 s	▶	NHM 8000 3.2 s	▼ 18 %

Minimum index degree for pallet opt.

Max. workpiece size (D x H)

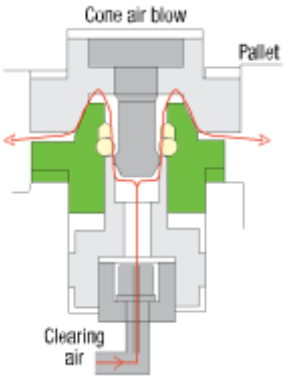
Previous model		NHM 5000	
800 x 800 mm (31.5 x 31.5 inch)	▶	850 x 1100 mm (33.4 x 43.3 inch)	55% ▲
1000 x 1000 mm (39.3 x 39.3 inch)	▶	1050 x 1350 mm (41.3 x 53.1 inch)	49% ▲
1310 x 1200 mm (51.5 x 47.2 inch)	▶	1450 x 1550 mm (57.0 x 61.0 inch)	58% ▲

Max. allowed weight (W)

Previous model		NHM 8000	
1600 kg (3527.4 lb)	▶	2000 kg (4409.2 lb)	25% ▲

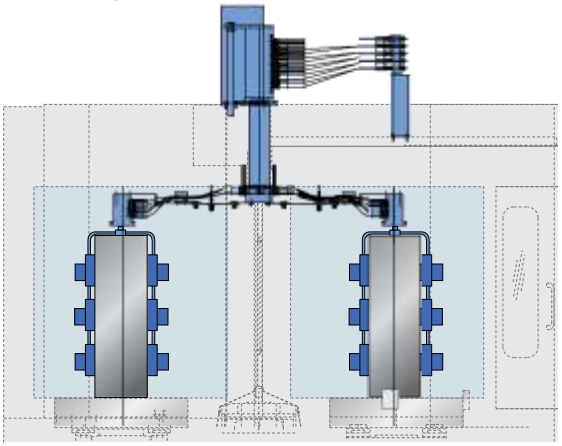
Accurate pallet positioning

As machining rates become faster, there is an increased risk of contamination of the pallet location caused by ingress of chips. A high pressure air blast is used to clean the taper cone location surfaces during the pallet change cycle.



Fixture features

Hydraulic supply to fixtures remains permanently connected even during pallet changing and table indexing.



Fixture variation (for hydraulic/pneumatic fixtures)

· Number of ports
- A/B Line : 2, 4, 6, 8 Pairs (Excluding solenoid valve)
- P/T Line : 2, 4, 6, 8 Pairs (Including solenoid valve)

· Hydraulic power unit for fixture
- 2.2 kW / 7MPa
- 3.7 kW / 15MPa
- 5.5 kW / 21MPa

· Contact Doosan for more information

Doosan Linear Pallet System [LPS] opt.

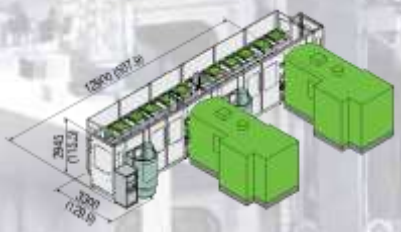
LPS is designed to provide the most optimized system for the customer. The customer can choose the most suitable package solution to their output and workspace. System expansion and changes in layout are easy. Two setup stations and 36 pallet storage racks can have up to three horizontal machining centers attached.

- Easily extendable up to 3 HMCs
- High efficiency of workpiece load space
- Quick installation
- Easy extension of system by modulized storage rack
- Auto-operation control by PC based OS
- Consistent with LPS provided by package
- Clear and simple status display
- Easy retrofitting to older HMC models

12 [10] Pallets Unit : mm (inch)

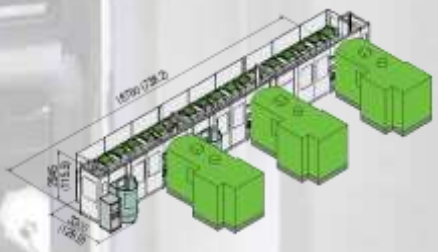
12 Pallet x 1 set up x 1 Machines

24 [20] Pallets Unit : mm (inch)



24 Pallet x 2 set up x 2 Machines

36 [30] Pallets Unit : mm (inch)



36 Pallet x 2 set up x 3 Machines

System variation

LPS 500 (Model : NHM 5000)

Number of machines	ea	1					2				3		
Number of pallets	ea	12	24		36		24		36		36		
Number of setup station	ea	1	1	2	1	2	1	2	1	2	1	2	

LPS 630 (Model : NHM 6300)

Number of machines	ea	1					2				3		
Number of pallets	ea	10	20		30		20		30		30		
Number of setup station	ea	1	1	2	1	2	1	2	1	2	1	2	

LPS 800 (Model : NHM 8000)

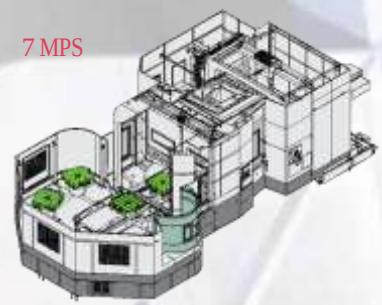
Number of machines	ea	1					2				3		
Number of pallets	ea	8	16		24		16		24		24		
Number of setup station	ea	1	1	2	1	2	1	2	1	2	1	2	

1 For further information and more details, contact Doosan.

Doosan Multi Pallet System [MPS] opt.

Compared to a standard twin-pallet machine, the MPS offers a long period of unmanned operation and flexibility to produce many different workpieces using the work scheduling function. This system can be easily retrofitted to existing machines in the field.

7 MPS



9 MPS

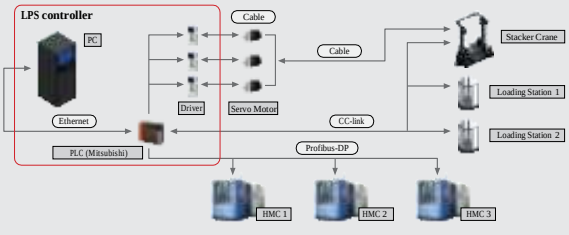
System variation

Model		NHM 5000		NHM 6300		NHM 8000	
		7- MPS	9 - MPS	7 - MPS	9 - MPS	7 - MPS	9 - MPS
Number of pallets	ea	7	9	7	9	7	9
Length (L)	mm (inch)	9490(373.6)	10140(399.2)	10560(415.7)	11000(433.0)	16010(630.3)	17150(675.2)
Width (W)	mm (inch)	4220(166.1)	4430(174.4)	4780(188.1)	5770(227.1)	5920(233.0)	6600(259.8)

LPS standard management software

- Easy way to register basic information for flexible manufacturing
- Platform management software for prompt production and quantity change
- LPS Management solution for flexible manufacturing & prompt production and quantity change

System Configuration



DPMS (Doosan Production Management System)

DPMS is an operating system which controls and manages LPS. The main window gives a solution to correspond flexibly and quickly in case of output change.

DMPS (Doosan Multi Pallet Station)

DMPS is an operating system which controls and manages MPS. DMPS provides functions such as scheduled operation, input and adjust set-up data and so on.

Easy chip-removal structure

Separate chip conveyor and coolant tank provide for easy cleaning and maintenance.
The completely enclosed NHM series guarantees to keep the chips and coolant inside of the machining area. Heavy-duty screw conveyors remove chips to the rear of the machine. This provides a cleaner working area for the operator.

Chip conveyor & coolant tank

Scraper type

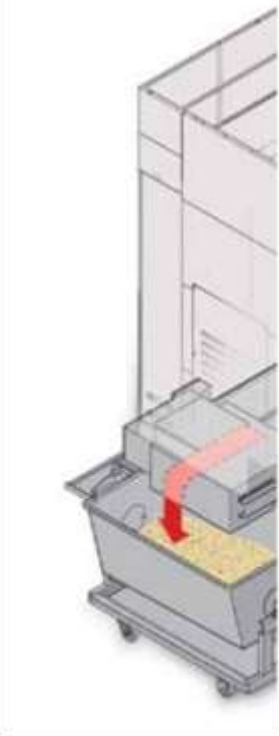
Drum filter type

Hinge type

Previous model
620 L
(163.8 galon)
▶
NHM 5000
825 L
(218.0 galon)
33 % ▲

Previous model
550 L
(145.3 galon)
▶
NHM 6300/8000
925 L
(244.4 galon)
68 % ▲

• Coolant tank capacity is increased



Chip removal equipment

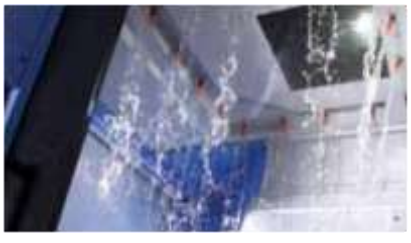
Flushing coolant (Slide cover, Splash guard)

Flood coolant

Flushing for the top of the spindle

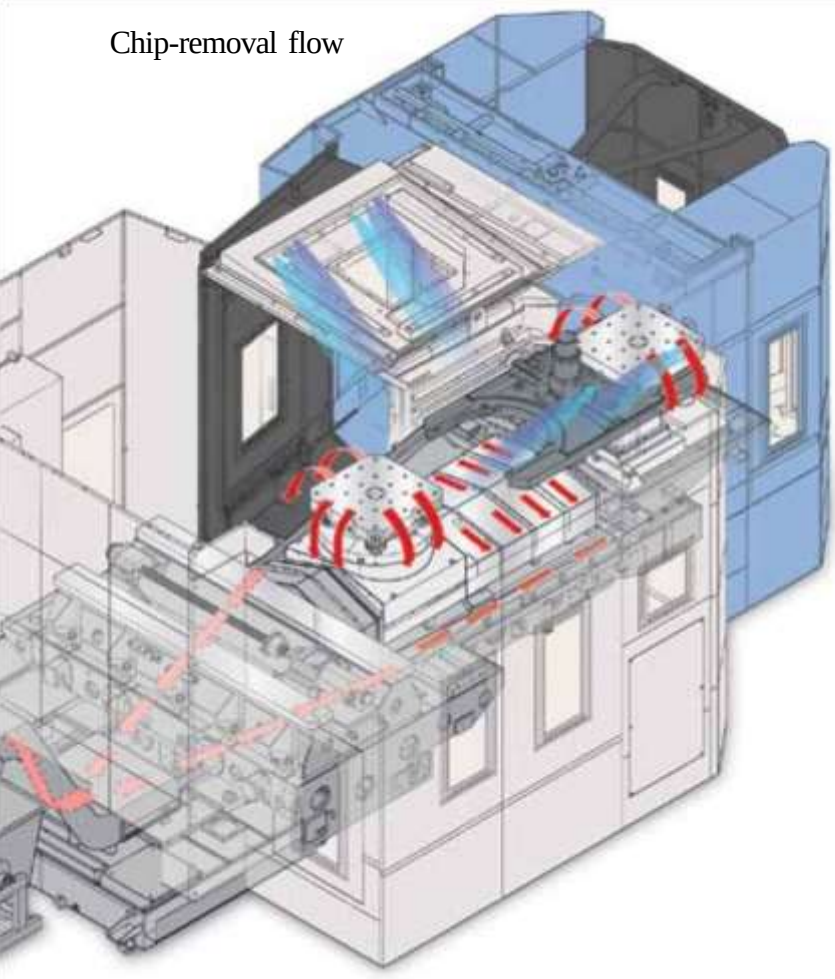
Screw conveyor

Shower coolant opt.



Coolant gun opt.

Chip-removal flow



Chip removal equipment

Through spindle coolant opt.

Semi permanent opt.
TSC pump unit

MQL system opt.

Air+Oil mist

Misting device

Eco-friendly equipment

Oil skimmer

Oil mist collector opt.

Measurement

Auto. tool breakage detection I opt.

Auto. tool breakage detection II opt.

Automatic tool measurement opt.

U-axis tool application opt.

Maintenance

Centralized air service unit

A centralized air service unit located near the operation door for maintenance convenience.

Easy Operation

User-Friendly Operation Panel

Consolidate a variety of control panel into unified concept design to provide convenience of operation as user-friendly design.

Button for customized funtions can be placed, for example fixture clamp/ unclamp button, counter, timer or special optional buttons.

Partitions are placed between all buttons to prevent pushing an unintended button.

Swivelling operating console

The operator control panel is mounted on an adjustable pendant for easy view and accessibility during set-up and operation. The layout and location of the panel is ergonomically designed to be efficient and convenient for the operator.

Portable MPG

Application suitable for CNC machines by providing home mode, stop adjustment and Interruption signal.

PCMCIA card

PCMCIA card is for downloading programs and is using the slot of the CNC Control. This offers added convenience to the user.

USB port

It's easy to input or output machining program or CNC data by USB.

- NC program, NC parameter, tool data and ladder program
- Input/output on Easy Guide i

In addition, it's possible to back up and restore CNC data by USB memory in the market. DNC machining is not supported in USB memory but PCMCIA card can be always used as more of high capacity program memory than input-output memory.

Easy Operation Package

The Doosan Easy Operation Package has been specially customized to provide user-friendly functions and control the magazine for tools and pallets.

Tool management

Tool management I

- 4 Digits tool numbers
- Display tool status
- Fastems MMS I/F (Tool Add/ Remove Function) opt.

Tool management II opt.

- Use balluff tool ID
- Tool life for each tool
- Life warning
- Display status & offset

Tool load monitor opt.

- Detect abnormal load
- Detect air cutting
- Auto teaching

ATC/APC panel

- ATC manual operation
- APC manual operation

Help

Easy NC parameter

- Display user parameters with comment

Calculator

- Calculator functions
- Hole/arc/factor/angle

M code list

- M code list for HMC

G code list

- G code list for HMC

Operation

Operation rate

- Operation rate for 3 workers manager password keep data for one month

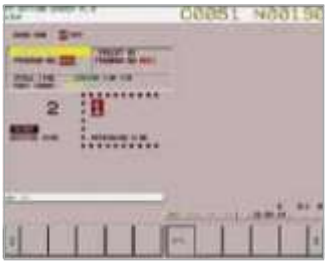
PMC switch

- optional toggle switch

Pallet magazine

Multi-pallet station opt.

- MPS control software
- Easy operation
- Setting pallet schedule



APC setting

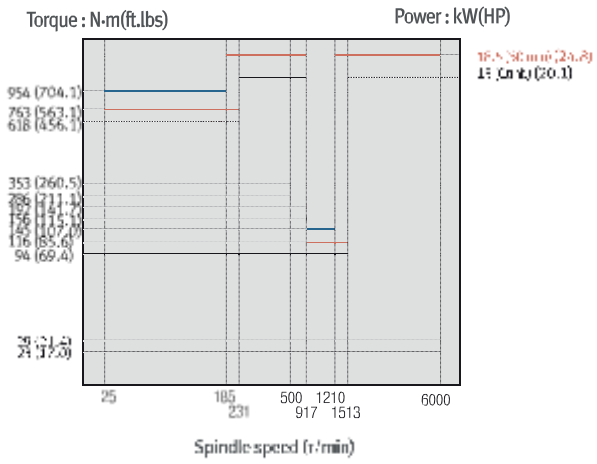
- 2 pallets APC setting

Spindle Power-Torque Diagram

Providing high productivity and heavy-duty cutting for a variety of machining operations

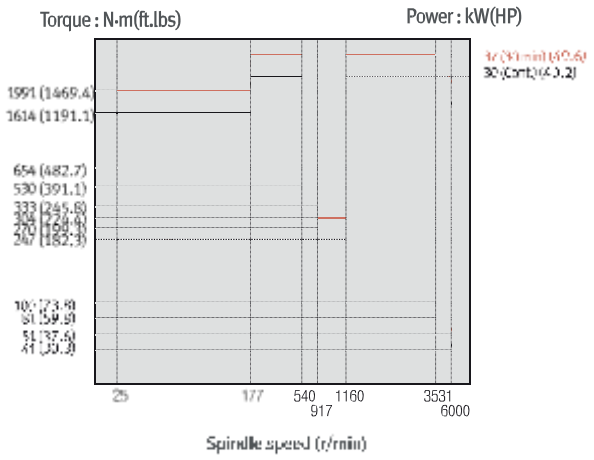
NHM 5000

Spindle : 6000 r/min
Motor : 15/18.5 kW (20.1/24.8 Hp)



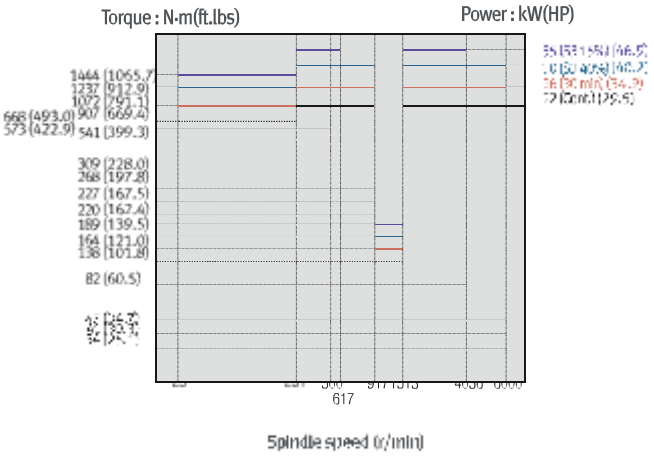
NHM 5000/6300/8000 opt.

Spindle : 6000 r/min
Motor : 30/37 kW (40.2/49.6 Hp)



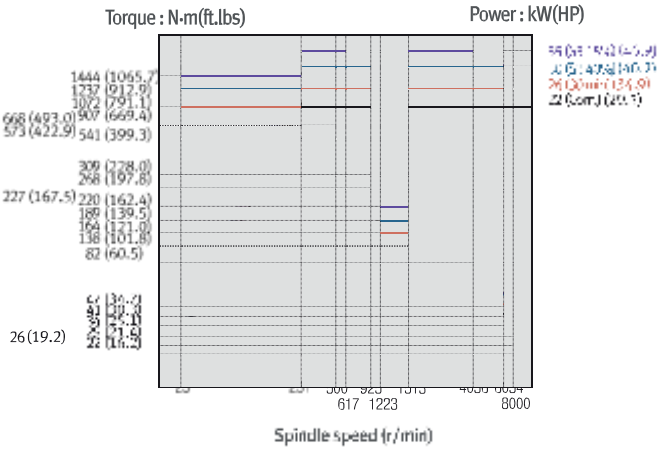
NHM 5000/6300/8000 opt.

Spindle : 6000 r/min
Motor : 22/35 kW (29.5/46.9 Hp)



NHM 5000/6300/8000 opt.

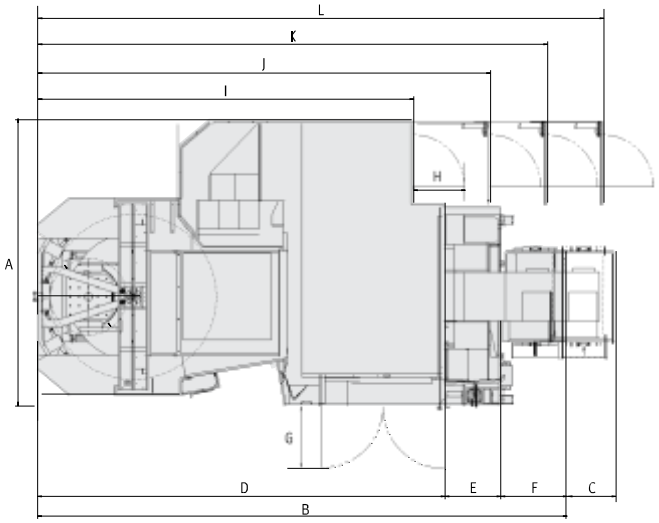
Spindle : 8000 r/min
Motor : 22/35 kW (29.5/46.9 Hp)



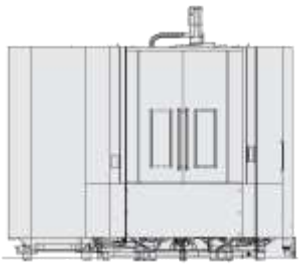
External Dimensions

NHM 5000/6300/8000

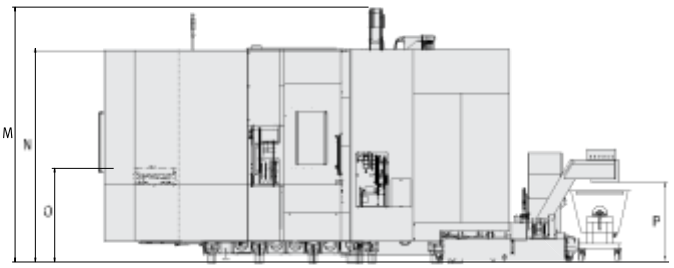
Top View



Front View



Side View



Unit : mm (inch)

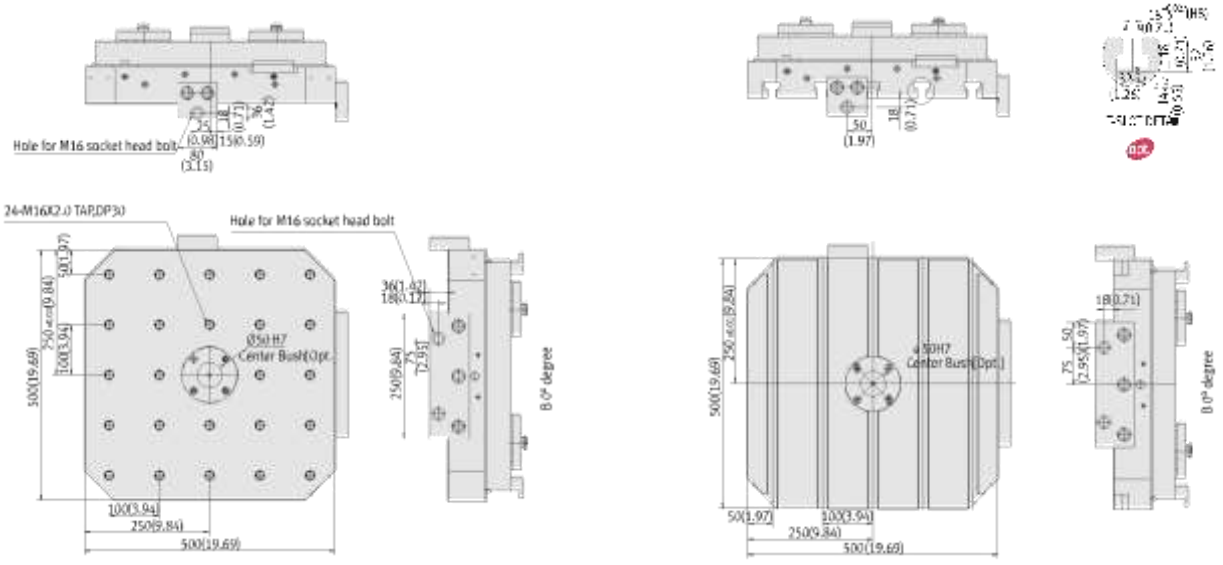
Model	A	B	C	D	E	F	G	H	I (60T)	J (90T)	K (120T)	L (150T)	M	N	O	P
NHM 5000	3670 (190.0)	6826 (269.2)	560 (22.0)	5101 (200.8)	950 (37.4)	775 (30.5)	660 (25.9)	746 (29.3)	4673 (183.9)	5773 (227.2)	6555 (258.0)	7443 (293.0)	3330 (131.1)	2735 (107.6)	1270 (50.0)	1088 (42.8)
NHM 6300	3930 (154.7)	7296 (285.0)	560 (22.0)	5571 (219.2)	950 (37.4)	775 (30.5)	660 (25.9)	746 (29.3)	5143 (202.4)	6193 (243.8)	6973 (274.5)	7743 (304.8)	3493 (137.5)	2927 (115.2)	1285 (50.5)	1088 (42.8)
NHM 8000	4325 (170.2)	8150 (320.8)	560 (22.0)	6425 (252.9)	950 (37.4)	775 (30.5)	660 (25.9)	746 (29.3)	5998 (236.1)	7048 (277.4)	7830 (308.0)	8598 (338.5)	3760 (148.0)	3193 (125.7)	1350 (53.1)	1088 (42.8)

● In case of side type chip conveyor is available an optional features.

Table Dimensions

NHM 5000

Unit : mm (inch)



NHM 6300

Unit : mm (inch)

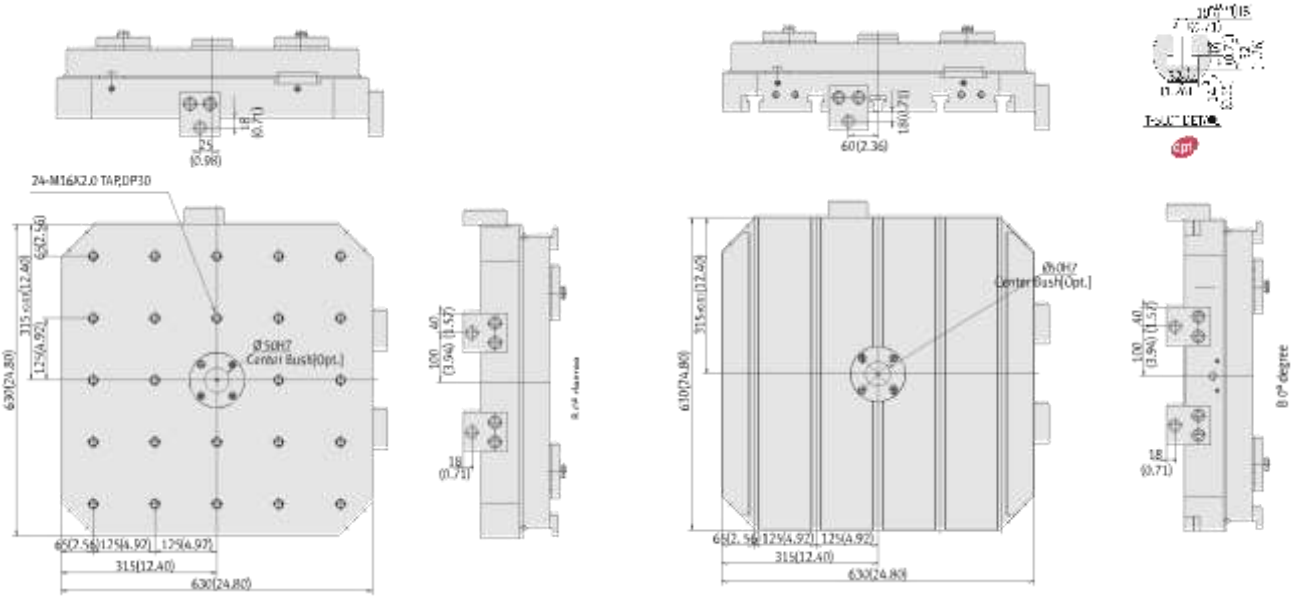
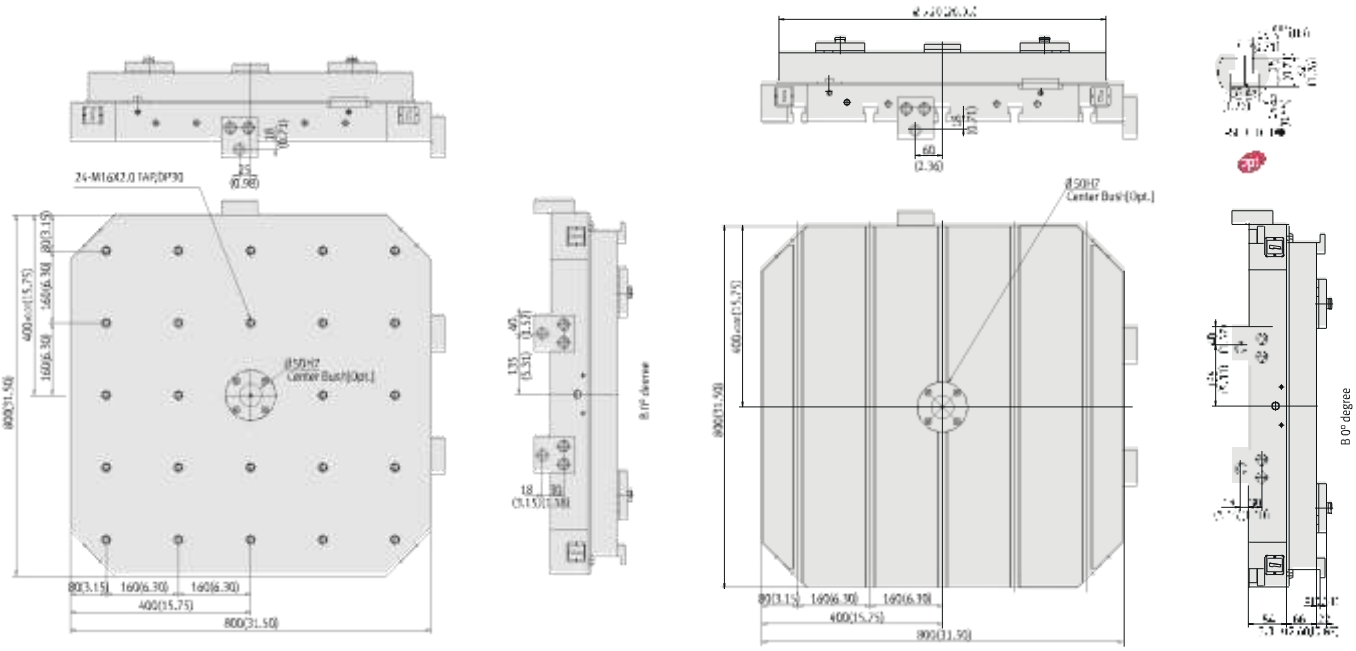
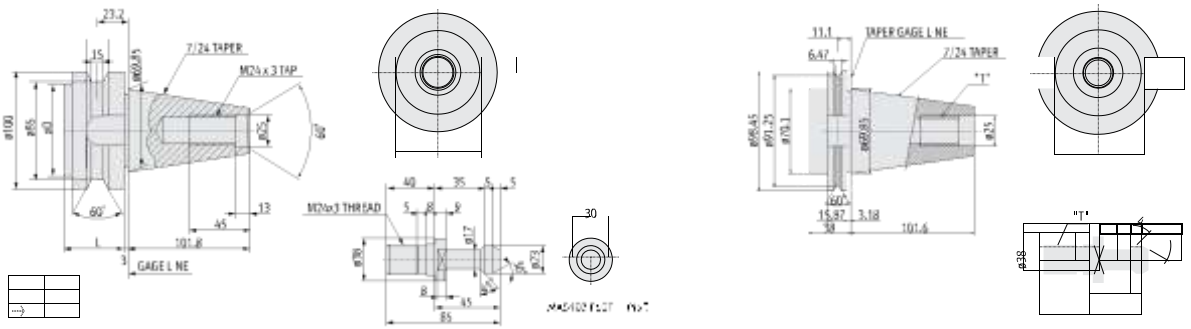


Table Dimensions/Tool Dimensions

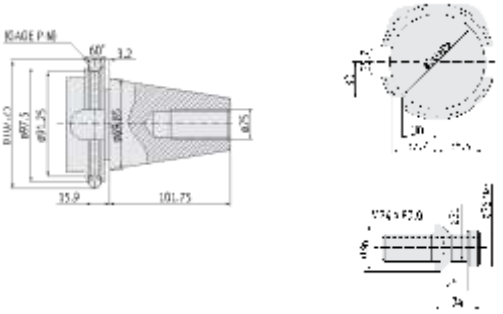
NHM 8000



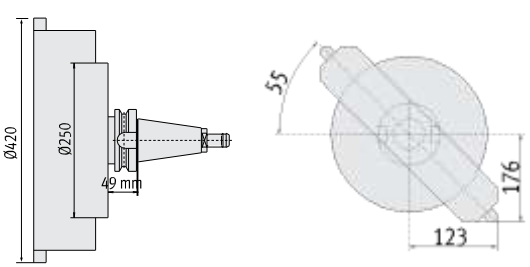
Tool Shank



DIN50 Unit : mm



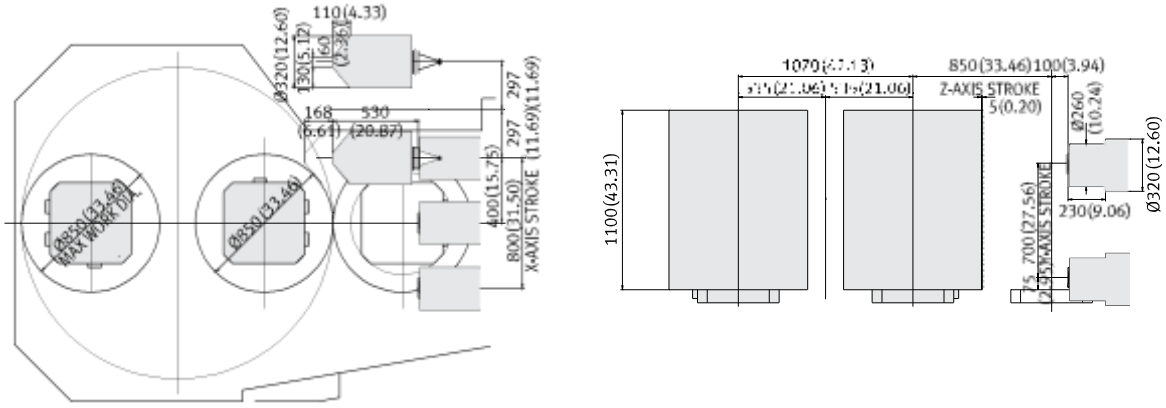
Boring bar Size Unit : mm



Maximum Tool & Workpiece diagram

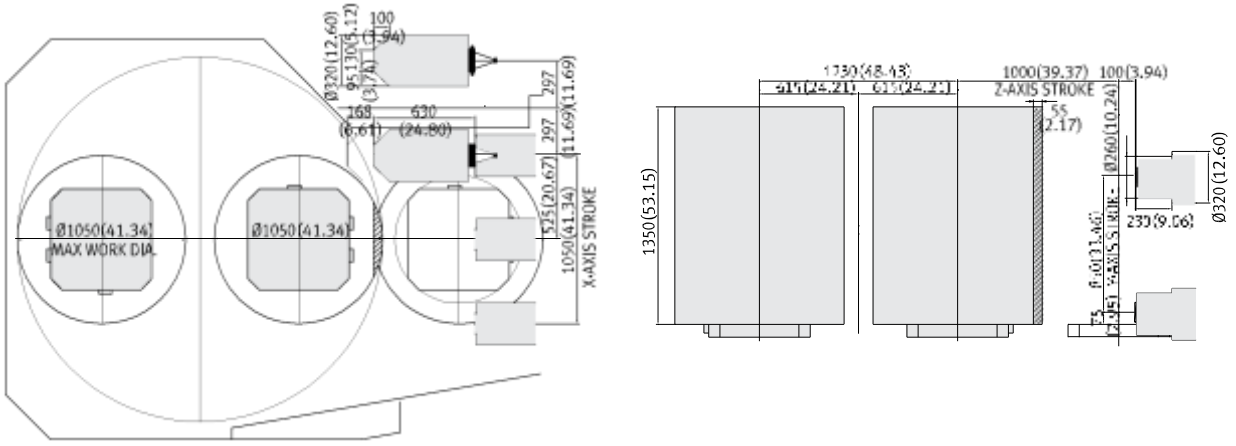
NHM 5000

Unit : mm (inch)



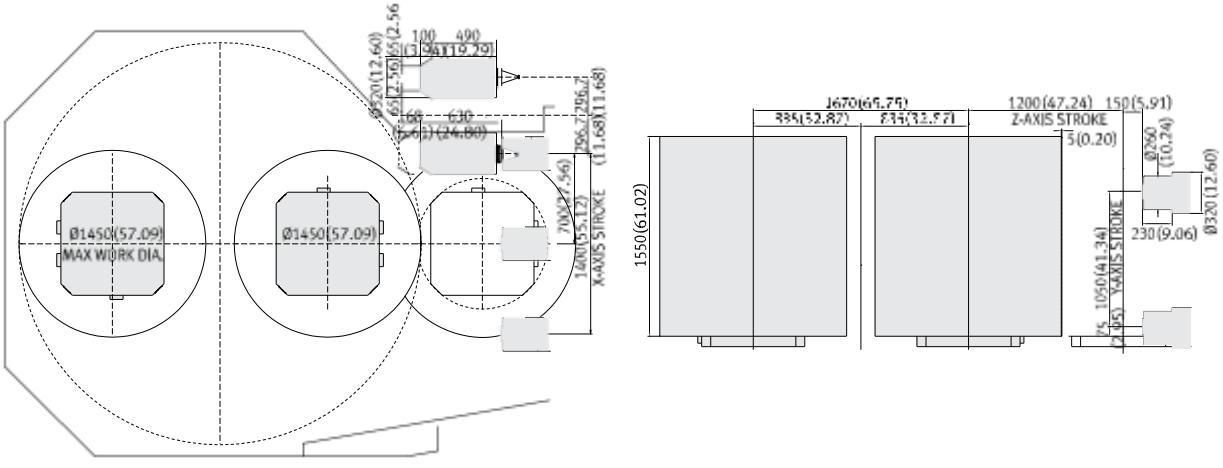
NHM 6300

Unit : mm (inch)



NHM 8000

Unit : mm (inch)



Machine Specifications

Features			Unit	NHM 5000	NHM 6300	NHM 8000
Travel	Travel (X / Y / Z)		mm (inch)	800 / 700 / 850 (31.5 / 27.6 / 33.5)	1050 / 850 / 1000 (41.3 / 33.5 / 39.4)	1400 / 1050 / 1200 (55.1 / 41.3 / 47.2)
	Distence from spindle nose to table center		mm (inch)	100 ~ 950 (3.9 ~ 37.4)	100 ~ 1100 (3.9 ~ 43.3)	150 ~ 1350 (5.9 ~ 53.1)
	Distence from spindle center to pallet top		mm (inch)	75 ~ 775 (3.0 ~ 30.5)	75 ~ 925 (3.0 ~ 36.4)	75 ~ 1125 (3.0 ~ 44.3)
Table	Pallet type		-	Index (Rotary)		
	Pallet indexing degree		deg.	1 (0.001)		
	Pallet loading capacity		kg (lb)	800 (1763.7)	1200 (2645.5)	2000 (4409.2)
	Max. workpiece size (ø x h)		mm (inch)	850 x 1100 (33.5 x 43.3)	1050 x 1350 (41.3 x 53.1)	1450 x 1550 (57.1 x 61.0)
	Pallet size		mm (inch)	500 x 500 (19.7 x 19.7)	630 x 630 (24.8 x 24.8)	800 x 800 (31.5 x 31.5)
Spindle	Max. spindle speed		r/min	6000 {8000}		
	Spindle taper		-	ISO#50, 7/24 Taper		
	Max. spindle power		kW (Hp)	15 / 18.5 {22 / 35, 30 / 37} (20.1 / 24.8 {29.5 / 46.9, 40.2 / 49.6})	22 / 35 {30 / 37} (29.5 / 46.9 {40.2 / 49.6})	
	Max. spindle torque		N·m (ft·lb)	954 {1134, 1444} (704.1 {836.9, 1065.7})	1444 {1991} (1065.7 {1469.4})	
Feedrate	Rapid traverse rate (X / Y / Z)		m/min (ipm)	30 / 30 / 30 {36 / 36 /36} (1181.1/1181.1/1181.1 {1417.3/1417.3/1417.3})		24 / 24 / 24 {30 / 30 / 30} (944.9/944.9/944.9 {1181.1/1181.1/1181.1})
	Cutting feedrate		mm/min (ipm)	15000 {18000} (590.6 {708.7})		12000 {15000} (472.4 {590.6})
Automatic pallet changer	Number of pallet		ea	2		
	Change type		-	Rotary Shuttles		
	Pallet change time		s	9.5	12	16
	Driving type of Pallet change		-	Servo Motor		
	Pallet rotation in loading station		deg.	90		
Automatic tool changer	Type of tool shank		-	BT / CAT / DIN, HSK		
	Tool storage capacity	Chain Type	ea	60 {90 / 120 / 150}		
		Matrix Type*	ea	196 / 256 / 316 / 376		
	Max. tool diameter		mm (inch)	130 (5.1)		
	Max. tool diameter without adj. tools		mm (inch)	320 (12.6)		
	Max. tool length		mm (inch)	530 {HSK : 600} (20.9 {HSK : 23.6})	630 {HSK : 700} (24.8 {HSK : 27.6})	
	Max. tool weight		kg (lb)	30 (66.1)		
	Tool change method		-	Servo Motor		
	Tool change time (tool-to-tool)		s	2.0		
Tank capacity	Coolant tank capacity		L (galon)	825 (218.0)	925 (244.4)	
Machine size	Machine height		mm (inch)	3330 (131.1)	3493 (137.5)	3760 (148.0)
	Machine dimension (Width x Length)	60 tool	mm (inch)	3685 x 6665 (145.1 x 262.4)	3930 x 7240 (154.7 x 285.0)	4325 x 8150 (170.3 x 320.9)
	Machine weight		kg (lb)	17500 (38580.3)	20500 (45194.1)	22500 (49603.3)

* : Matrix Magazine is option.
Note : { } are optional.

Standard feature

- Coolnat tank & chip pan
- Machine installation parts
- Oil skimmer
- Screw conveyor
- Signal tower (yellow / red / green)
- Spindle head cooling system

Optional feature

- Min. index degree for pallet
- 5axis preparation
- Air gun
- Auto. workpiece measurement
- Automatic power off
- Automatic tool measurement
- Coolant gun
- Test bar
- Shower coolant
- Hyd. fixture interface
- Through spindle coolant
  (In Case of water soluble)

Type	Frequency(HZ)	Flux(L/min)	Pressure(MPa)
1.9 MPa T.S.C	50	8	1.76
	60	10	1.91
	50	12	2.74
	60	16	2.94
2.94 MPa T.S.C	50	22	6.86
	60	30.7	6.86
6.86 MPa T.S.C			

NC Unit Specifications

FANUC 31i-B

Axes control	
Controlled axes	4 (X,Y,Z,B)
Simultaneously controllable axes	4 axes
	Positioning (G00) / Linear interpolation (G01) : 3 axes
	Circular interpolation (G02, G03) : 2 axes
Backlash compensation	
Emergency stop / overtravel	
Follow up	
Least command increment	0.001mm (inch) / 0.0001"
Least input increment	0.001mm (inch) / 0.0001"
Machine lock	all axes / Z axis
Mirror image	Reverse axis movement
	(setting screen and M - function)
Stored pitch error compensation	Pitch error offset compensation for each axis
	Overtravel controlled by software
Stored stroke check 1	

Interpolation & Feed funtion	
Positioning	G00
Linear interpolation	G01
Circular interpolation	G02, G03
2nd reference point return	G30
Dwell	G04
Exact stop check	G09, G61(mode)
Skip function	G31
Reference point return	G27, G28
2nd reference point return	G30
Feed per minute	mm / min(ipm)
Rapid traverse override	F0 (fine feed), 25 / 50 / 100%
Feedrate override (10% increments)	0 - 200%
Jog override (10% increments)	0 - 200%
Override cancel	M48 / M49
Manual handle feed (1 unit)	
Manual handle feedrate	0.1/0.01/0.001mm(inch)
Automatic acceleration/deceleration	
Helical interpolation	
DSQ1 (AICC II + Machine condition selection function)	200 block preview
Thread cutting, synchronous cutting	
Program restart	
Automatic corner deceleration	
Feedrate clamp by circular acceleration	
Linear ACC/DEC before interpolation	
(Specify AI Contour control II)	
Linear ACC/DEC after interpolation	
Rapid traverse bell-shaped acceleration	

Spindle & M-code funtion	
M- code function	M 3 digits
Spindle orientation	
Spindle serial output	
Spindle speed command	S5 digits
Spindle speed override (10% increments)	10 - 150%
Spindle output switching	
Retraction for rigid tapping	
Rigid tapping	G84, G74

Tool funtion	
Tool nose radius compensation	G40, G41, G42
Number of tool offsets	200 ea
Tool length compensation	G43, G44, G49
Tool number command	T3 digits
Tool life management	Geometry / Wear and Length / Radius offset memory
Tool offset memory C	
Tool length measurement	

Programming & Editing funtion	
Absolute / Incremental programming	G90 / G91
Auto. Coordinate system setting	
Background editing	
Canned cycle	G73, G74, G76, G80 - G89, G99
Circular interpolation by radius programming	
Custom macro B	
Custom size	2MB
Addition of custom macro common variables	
Decimal point input	
I / O interface	RS - 232C
Inch / metric conversion	G20 / G21
Label skip	
Local / Machine coordinate system	G52 / G53
Maximum commandable value	±99999.999mm (±9999.9999 inch)
No. of Registered programs	500 ea
Optional block skip	
Optional stop	M01
Part program storage	256kb (640m)
Program number	O4-digits
Program protect	
Program stop / end	M00 / M02, M30
Programmable data input	Tool offset and work offset are entered by G10, G11
Sub program	Up to 10 nesting
Tape code	ISO / EIA Automatic discrimination
Work coordinate system	G54 - G59

Others funtion (Operation, Setting & Display, etc)	
Alarm display	
Alarm history display	
Clock function	
Cycle start / Feed hold	
Display of PMC alarm message	Message display when PMC alarm occurred
Dry run	
Ethernet function (Embeded)	
Graphic display	Tool path drawing
Help function	
Loadmeter display	
MDI / DISPLAY unit	10.4" color LCD, Keyboard for data input, soft-keys
Memory card interface	
Operation functions	Tape / Memory / MDI / Manual
Operation history display	
Program restart	
Run hour and part number display	
Search function	Sequence NO. / Program NO.
Self - diagnostic function	
Servo setting screen	
Single block	
External data input	
Multi language display	

Optional specifications	
3-dimensional coordinate conversion	
3-dimensional tool compensation	
3rd / 4th reference return	
Addition of tool pairs for tool life management	1024 pairs
Additional controlled axes	max. 12 axes per 1path
Additional work coordinate system	G54.1 P1 - 300 (300 pairs)
Part Program Storage	512kb/1MB/2MB/4MB/8MB
DSQ 2 (AICC II + Machine condition selection function + Data server + 1GB)	200 block preview
DSQ 3 (AICC II with High speed processing + Machine condition selection function + Data server + 1GB)	600 block preview
Automatic corner override	G62
Chopping function	G81.1
Cylindrical interpolation	G07.1
Dynamic graphic display	Machining profile drawing
Interpolation type pitch error compensation	
EZ Guide i (Doosan infracore Conversational Programming Solution) with 10.4" Color TFT	

Note : { } are optional.

NC Unit Specifications

SIEMENS 840D SL NCU710.2

Axes control	
Controlled axes	4 axes (X,Y,Z,B)
Simultaneously controllable axes	Max. 5 axes
Backlash compensation	
Emergency stop / Overtravel	
Follow up	
Least command increment	0.001mm (inch) / 0.001°
Least input increment	0.001mm (inch) / 0.001°
Machine lock (PRT)	all axes
Mirror image	
Stored pitch error compensation	Pitch error offset compensation for each axis
Stored stroke check (1st,2nd)	Overtravel controlled by software

Interpolation & Feed funtion	
Positioning	G00
Linear Interpolation	G01
Circular interpolation	G02,G03
Reference point return (1st ~ 4th)	G75 FP=1,2,3,4 (*G28,*G30)
Dwell	G04
Exact stop check	G09,G60 (*G61)
Skip function	MEASA,MEASC (*G31)
Feedrate / Rapid traverse override	0 ~ 120%
Programmable feedrate override	OVR,OVRRAP,OVRA
Manual handle feed (1 unit)	
Manual handle feedrate	0.1/ 0.01/ 0.001mm(inch) Automatic acceleration/deceleration
Helical interpolation	
Look ahead number of blocks	150 blocks
Thread cutting, synchronous cutting	
Automatic corner deceleration	
Feedrate clamp by circular acceleration	
Linear ACC/DEC before interpolation	
Advanced surface	
Linear ACC/DEC after interpolation	
Rapid traverse bell-shaped acceleration	BRISK,SOFT

Spindle & M-code funtion	
M-code function	M 3 digits
Spindle orientation	
Spindle speed command	S 5 digits
Spindle speed override (5% increments)	50 ~ 120%
Spindle output switching	
Rigid tapping	G331, G332

Tool funtion	
Tool nose radius compensation	G40,G41,G42
Number of tool offsets	600 ea
Tool length compensation	
Tool number command	T3 digits
Tool life management	Geometry / Wear and Length / Radius offset memory
Tool length measurement	Manual std. (Auto. opt.)

Programming & Editing funtion	
Absolute / Incremental programming	G90 / G91
Auto. Coordinate system setting	
Background editing	
Dual editor	
Canned cycle	Drilling cycles, Milling cycles, Contour Milling cycles *G73,*G74,*G76,*G80~G87,*G89,*G99
Circular interpolation by radius programming	
Decimal point input	
I/O interface	RS-232C, USB
Inch / metric conversion	G70 / G71
Label skip	
Local / Machine coordinate system	
Automatic corner override	*G62
Maximum commandable value	±999999.999mm (99999.9999 inch)
No. of Registered programs	500 ea
Optional block skip	8 ea
Optional stop	M01
Part program storage size	Max. 3 MB

Program name	24 characters
Program protect	
Program stop / end	M00 / M02,M30
Programmable data input	
Sub program	Up to 15 nesting
Tape code	Punched tape, Binary format
Work coordinate system	G54~G59,G505~G599
Shopmill	

Others funtion (Operation, Setting & Display, etc)	
Alarm display	
Alarm history display	
Clock function	
Cycle start / Feed hold	
Display of PLC alarm message	Message display when PLC alarm occurred
Dry run	
Ethernet function	
Graphic display	Tool path drawing
Help function	
Loadmeter display	
MDI / DISPLAY unit	10.4" color LCD, keyboard for data input, softkey
memory card interface	
Operation functions	Auto / MDI / JOG
Repositioning	REPOS,REPOSA
Operation history save	
Program restart (Block search)	Sequence no. / Program no.
Run hour and part number display	
Self-diagnostic function	
Single block External	
data input Multi	
language display	
Screen saver	
Dynamic graphic display (Simulation)	

Optional specifications	
3-dimensional coordinate conversion	
3-dimensional tool compensation	
Additional controlled axes	max. 6 axes per 1path (NCU 710.2)
	max. 31 axes per 1path (NCU 720.2)
	max. 31 axes per 1path (NCU 730.2)
Chopping function	
Cylinderical interpolation	

*: Be only available in ISO-mode (G291)

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